

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In Re Application of:

Martin, et al.

Confirmation No.: To Be Assigned

Group Art Unit: 1763

Serial No.: To Be Assigned

Examiner: Hassanzadeh, Parvis

Filed: Even Date Herewith

Docket No.: 62002-1752

For: Method and Apparatus for Low energy Electron Enhanced Etching of Substrates in an AC or DC Plasma Environment

INFORMATION DISCLOSURE STATEMENT

Commissioner for Patents

P.O. Box 1450

Alexandria, Virginia 22313-1450

Sir:

This information disclosure statement is filed in accordance with 37 C.F.R. §§ 1.56, 1.97, and 1.98, and specifically:

- ☒ under 37 CFR 1.97(b), or
(within Three months of filing national application; or date of entry of international application; or before mailing date of first office action on the merits; whichever occurs last)
- ☐ under 37 CFR 1.97(c) together with either a:
☐ Statement Under 37 C.F.R. 1.97(e), or
☐ a \$180.00 fee under 37 CFR 1.17(p), or
(After the CFR 1.97(b) time period, but before the final office action or notice of allowance, whichever occurs first)
- ☐ under 37 CFR 1.97(d) together with a:
☐ Statement under 37 CFR 1.97(e), and
☐ a \$180.00 petition fee set forth in 37 CFR 1.17(p).
(Filed after final office action or notice of allowance, whichever occurs first, but before payment of the issue fee)

Enclosed is a check in the amount of \$

Enclosed is Credit Card Payment Form (PTO-2038) in the amount of \$

Please charge \$0.00 to deposit account 20-0778. At any time during the pendency of this application, please charge any fees required to Deposit Account 20-0778 pursuant to 37 CFR 1.25. The Commissioner is hereby requested to credit any overpayment to Deposit Account No. 20-0778.

- ☒ Applicant(s) submit herewith *Form PTO 1449A - Information Disclosure Statement by Applicant* together with copies (where required) of patents, publications or other information of which applicant(s) are aware, which applicant(s) believe(s) may or may not be material to the examination of this application and for which there may be a duty to disclose in accordance with 37 CFR 1.56. As required by 37 C.F.R. §1.98(a), a legible copy of each document is provided.

- ☐ A concise explanation of the relevance of foreign language patents, foreign language publications and other foreign language information listed on PTO Form 1449, as presently understood by the individual(s) designated in 37 CFR 1.56(c) most knowledgeable about the content is given on the attached sheet, or where a foreign language patent is cited in a search report or other action by a foreign patent office in a counterpart foreign application, an English language version of the search report or action which indicates the degree of relevance found by the foreign office is listed on the form PTO 1449 and is enclosed herewith.

The following rights are reserved by the Applicant(s): the right to establish the patentability of the claimed invention over any of the listed documents should they be applied as reference, and/or the right to prove that some of these documents may not be prior art, and/or the right to prove that some of these documents may not be enabling for the teachings they purport to offer.

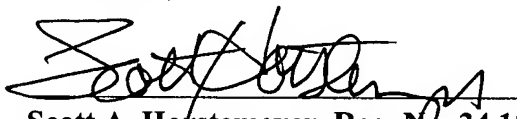
This statement should not be construed as a representation that an exhaustive search has been made, or that information more material to the examination of the present application does not exist. Any statements or identifications regarding the relevance of any portion(s) of cited references should not be construed as a representation that the most relevant portion(s) have been identified, and the absence of such statements or identifications should not be construed as representations that there are no relevant portion(s). The Examiner is specifically requested not to rely solely on the materials submitted herewith. The Examiner is requested to conduct an independent and thorough review of the documents, and to form independent opinions as to their significance.

It is requested that the information disclosed herein be made of record in this application and that the Examiner initial and return a copy of the enclosed PTO-1449 to indicate the documents have been considered.

Respectfully Submitted,

THOMAS, KAYDEN, HORSTEMEYER
& RISLEY, L.L.P.

By:


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EXPRESS MAIL

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Signature – Gloria L. Knox

Form PTO-1449					Attorney Docket No. 062002-1752		Serial No. To Be Assigned	
INFORMATION DISCLOSURE CITATION					Applicant Martin, et al.			
<i>(Use several sheets if necessary)</i>					Filing Date Even Date Herewith		Group 1763	
U.S. PATENT DOCUMENTS								
Examiner Initials	Item	Document Number	Date	Name	Class	Subclass	Filing Date If Appropriate	
	1A	1,712,407	5/7/1929	Skaupy				
	1B	2,037,075	4/14/1936	Haines	250	27.5		
	1C	3,304,456	2/14/1967	De Lany et al.	313	182		
	1D	3,879,597	4/22/1975	Bersin et al.	219	121		
	1E	4,031,424	6/21/1977	Penfold et al.	313	146		
	1F	4,207,158	6/10/1980	Freeman	204	180		
	1G	4,259,145	3/31/1981	Harper et al.	156	643		
	1H	4,298,443	11/3/1981	Maydan	204	192		
	1I	4,309,267	1/5/1982	Boyd et al.	204	298		
	1J	4,450,787	5/29/1984	Weakliem et al.	118	723		
	1K	4,464,223	05/1999	Gorin	438	729		
	1L	4,496,881	1/29/1985	Cheever	315	357		
FOREIGN PATENT DOCUMENTS								
		Document Number	Date	Country	Class	Subclass	Translation	
							Yes	No
	1M							
	1N							
OTHER DOCUMENTS (Including Author, Title, Date, Pertinent Pages, etc.)								
	1O	P. Breisacher et al. "Comparative Stabilities of Gaseous Alane, Gallane and Indane" Journal of the American Chemical Society pp. 4255-4258 87:19 Oct 5, 1965.						
	1P	S. Veprék et al. "The Preparation of Thin Layers of Ge and Si by Chemical Hydrogen Plasma Transport." Solid-State Electronics Pergamon Press 1968 vol. 11 pp. 683-684.						
	1Q	E. Wiberg et al "Hydrides of the Elements of Main Groups I-IV" New York 1971 Chapter 6 pp. 443-460.						
	1R	A.P. Webb "Reactivity of Solid Silicon with Hydrogen Under Conditions of a Low Pressure Plasma." Chemical Physics Letters vol 62 No 1 Mar 15, 1979 pp 173-177.						
	1W	S. Veprék et al. "Parameters Controlling the Deposition of Amorphous and Microcrystalline Silicon in Si/H Discharge Plasmas." Journal De Physique (Paris) 42 C4-251 (1981).						
<p>* EXAMINER: Initial if citation considered, whether or not citation is in conformance with MPEP § 609. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to the applicant.</p>								
EXAMINER'S SIGNATURE:					DATE CONSIDERED:			

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Even Date HerewithGroup
1763**U.S. PATENT DOCUMENTS**

Examiner Initials	Item	Document Number	Date	Name	Class	Subclass	Filing Date If Appropriate
	2A	4,609,428	9/2/1986	Fujimara	156	643	
	2B	4,863,549	09/1989	Grunwald, Henrich	156	345.44	
	2C	4,871,580	10/3/1989	Schram et al.	427	38	
	2D	4,874,459	10/17/1989	Coldren et al.	156	643	
	2E	4,891,118	01/1990	Ooiwa et al.	204	298.34	
	2F	5,003,178	3/26/1991	Livesay	250	492.300	
	2G	5,039,376	8/13/1991	Zukotynski et al.	156	643	
	2H	5,138,169	8/11/1992	Yamazaki et al.	250	398	
	2I	5,145,554	9/8/1992	Seki et al.	156	643	
	2J	5,241,535	8/31/1993	Yoshikawa	370	60	
	2K	5,290,993	03/1994	Kaji et al.	219	121.43	
	2L	5,298,896	3/29/1994	Lei et al.	341	51	
	2M	5,309,232	5/3/1994	Hartung et al.	348	384	

FOREIGN PATENT DOCUMENTS

		Document Number	Date	Country	Class	Subclass	Translation	
							Yes	No
	2N							
	2O							

OTHER DOCUMENTS (Including Author, Title, Date, Pertinent Pages, etc.)

	2P	S. Veprek et al "Electron-Impact-Induced Anisotropic Etching of Silicon by Hydrogen" Plasma Chemistry and Plasma Processing vol. 2 No 3 1982.
	2Q	S. Veprek "Highlights of Preparative Solid State Chemistry in Low Pressure Plasmas." Pure & Appl. Chem. Vol. 54 No. 6 pp. 1197-1220. 1982.
	2R	J.R. Creighton "Hydrogen Chemisorption and Reaction on GaAs(100)." J. Vac. Sci. Technol. A 8 (6) Nov/Dec 1990 pp. 3984-3987.
	2S	H.P. Gillis et al "Low-Energy Electron Beam Enhanced Etching of Si(100)-(2x1) by Molecular Hydrogen" J. Vac. Sci. Technol B. vol. 10 No. 6. Nov/Dec 1992.
	2T	H. Watanabe et al "Electron-beam-assisted Dry Etching for GaAs using Electron Cyclotron Resonance Plasma Electron Source" Appl Phys. Lett 61 (25) Dec 21, 1992 pp. 3011-3013.

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U.S. PATENT DOCUMENTS							
Examiner Initials	Item	Document Number	Date	Name	Class	Subclass	Filing Date If Appropriate
	3A	5,310,452	05/1994	Doki et al.	438	728	
	3B	5,331,249	7/19/1994	Minamikata et al.	313	632	
	3C	5,352,953	10/4/1994	Wakabayashi et al.	313	631	
	3D	5,368,676	11/29/1994	Nagaseki et al.	156	345	
	3E	5,418,423	5/23/1995	Murray	313	589	
	3F	5,453,305	9/26/1995	Lee	427	562	
	3G	5,457,298	10/10/1995	Nelson et al.	219	121.52	
	3H	5,485,210	1/16/1996	Lim et al.	348	409	
	3I	5,497,053	3/5/1996	Tang et al.	315	366	
	3J	5,556,501	9/17/1996	Collins et al.	156	345	
	3K	5,572,088	11/5/1996	Aizawa et al.	313	491	
	3L	5,606,370	2/25/1997	Moon	348	390	

FOREIGN PATENT DOCUMENTS							
		Document Number	Date	Country	Class	Subclass	Translation
							Yes No
	3M						
	3N						

OTHER DOCUMENTS <i>(Including Author, Title, Date, Pertinent Pages, etc.)</i>		
	3O	K. Choquette et al "Hydrogen Plasma Processing of GaAs and AlGaAs" J. Vac. Sci. Technol B. vol 11 No. 6 Nov/Dec 1993 pp 2025-2032.
	3P	H.P. Gillis et al. "Low Energy Electron-Enhanced Etching of Si(100) in Hydrogen/Helium Direct-Current Plasma." Appl. Phys. Lett. 66 (19) May 8, 1995.
	3Q	H.P. Gillis et al. "The Dry Etching of Group III-Nitride Wide-Bandgap Semiconductors" Journal of Materials 48 50-55 (1996).
	3R	H.P. Gillis et al "Low Energy Electron-Enhanced Etching of GaAs(100) In a Chlorine/Hydrogen DC Plasma." Appl. Phys. Lett 68(16) Apr. 15, 1996.
	3S	H.P. Gillis et al "Low Energy Electron-Enhanced Etching of GaN/Si in Hydrogen Direct Current Plasma" J. Electrochem Soc. Vol 143. No. 11 Nov. 1996.

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Examiner Initials	Item	Document Number	Date	Name	Class	Subclass	Filing Date If Appropriate
	4A	5,631,978	5/20/1997	Galand et al.	382	240	
	4B	5,660,744	8/26/1997	Sekine et al.	219	121.43	
	4C	5,882,538	3/16/1999	Martin et al.	216	71	
	4D	5,890,102	3/30/1999	Kossentini et al.	702	181	
	4E	5,906,684	05/19/099	Tamura et al.	118	728	
	4F	5,917,285	6/29/1999	Gillis et al.	313	632	
	4G	5,983,828	11/1999	Savas, Stephen E.	118	7231	
	4H	6,033,587	3/7/2000	Martin et al.	216	71	
	4I	6,231,777	05/2001	Kofuji et al.	216	71	
	4J	6,258,287	7/10/2001	Martin et al.	216	71	

FOREIGN PATENT DOCUMENTS							
		Document Number	Date	Country	Class	Subclass	Translation
							Yes No
	4K						
	4L						

OTHER DOCUMENTS <i>(Including Author, Title, Date, Pertinent Pages, etc.)</i>		
	4M	H.P. Gillis et al "Highly Anisotropic, Ultra-smooth Patterning of GaN/SiC by Low Energy Electron Enhanced Etching in DC Plasma" J. Electronic Mat 26, 301-305 (1997) pp 1-16.
	4N	
	4O	

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